Appl. No. 10/635,779
Amendt. dated August 16, 2005
Reply to Final Office Action of May 17, 2005

Amendment to the Claims:

This listing of claims will replace all prior versions and listings of claims in the application.

Listing of Claims:

Please cancel claims 1, 2, 3, 4, 5, 7, 9, 13, 14 and 16.

Claims 1 - 5 (canceled)

Claim 6 (currently amended) A hydrogen passivation shut down system for a fuel cell power plant (10), the system comprising:

a. at least one fuel cell (12) for generating electrical current from hydrogen containing reducing fluid fuel and oxygen containing oxidant reactant streams, the fuel cell (12) including an anode catalyst (14) and a cathode catalyst (16) on opposed sides of an electrolyte (18), an anode flow path (24) in fluid communication with the anode catalyst (14) for directing the hydrogen fuel to flow through the fuel cell (12) and adjacent the anode catalyst (14), and a cathode flow path (38) in fluid communication with the cathode catalyst (16) for directing the oxidant stream to flow through the fuel cell (12) and adjacent the cathode catalyst (14);

b. a hydrogen inlet valve (52) secured between a hydrogen containing reducing fluid fuel source (54) and the anode flow path (24) for selectively permitting the

hydrogen fuel to flow into the anode flow path (24);

c. an oxidant inlet valve (56) secured between an oxygen containing oxidant source (58) and the cathode flow path (38) for selectively permitting the oxidant to flow into the cathode flow path (38);

d. hydrogen transfer means secured in communication between the anode flow path (24) and the oxidant flow path (38) for selectively permitting flow of the hydrogen fuel between the anode flow path (24) and the cathode flow path (38);

e. hydrogen reservoir means secured in fluid communication with the anode flow path (24) for storing the hydrogen fuel whenever the hydrogen inlet valve (52) is open to permit flow of the hydrogen fuel through the anode flow path (24), and for releasing hydrogen fuel into the anode flow path (24) whenever the hydrogen inlet valve (52) is closed; and,

f. ~~The system of claim 1,~~ wherein the hydrogen reservoir means comprises a hydrogen storage media secured within a porous anode substrate layer (20) supporting the anode catalyst (14).

Claim 7 (canceled)

Claim 8 (currently amended) A hydrogen passivation shut down system for a fuel cell power plant (10), the system comprising:

a. at least one fuel cell (12) for generating electrical current from hydrogen containing reducing fluid fuel and oxygen containing oxidant reactant streams, the

fuel cell (12) including an anode catalyst (14) and a cathode catalyst (16) on opposed sides of an electrolyte (18), an anode flow path (24) in fluid communication with the anode catalyst (14) for directing the hydrogen fuel to flow through the fuel cell (12) and adjacent the anode catalyst (14), and a cathode flow path (38) in fluid communication with the cathode catalyst (16) for directing the oxidant stream to flow through the fuel cell (12) and adjacent the cathode catalyst (14);

b. a hydrogen inlet valve (52) secured between a hydrogen containing reducing fluid fuel source (54) and the anode flow path (24) for selectively permitting the hydrogen fuel to flow into the anode flow path (24);

c. an oxidant inlet valve (56) secured between an oxygen containing oxidant source (58) and the cathode flow path (38) for selectively permitting the oxidant to flow into the cathode flow path (38);

d. hydrogen transfer means secured in communication between the anode flow path (24) and the oxidant flow path (38) for selectively permitting flow of the hydrogen fuel between the anode flow path (24) and the cathode flow path (38);

e. hydrogen reservoir means secured in fluid communication with the anode flow path (24) for storing the hydrogen fuel whenever the hydrogen inlet valve (52) is open to permit flow of the hydrogen fuel through the anode flow path (24), and for releasing

hydrogen fuel into the anode flow path (24) whenever the hydrogen inlet valve (52) is closed; and,

f. ~~The system of claim 1,~~ wherein the hydrogen transfer means comprises a hydrogen transfer electrochemical pump including a direct current source secured in electrical communication with the fuel cell (12) so that hydrogen is consumed at the anode catalyst (14) and evolved at the cathode catalyst (16).

Claim 9 (canceled)

Claim 10 (currently amended) A hydrogen passivation shut down system for a fuel cell power plant (10), the system comprising:

a. at least one fuel cell (12) for generating electrical current from hydrogen containing reducing fluid fuel and oxygen containing oxidant reactant streams, the fuel cell (12) including an anode catalyst (14) and a cathode catalyst (16) on opposed sides of an electrolyte (18), an anode flow path (24) in fluid communication with the anode catalyst (14) for directing the hydrogen fuel to flow through the fuel cell (12) and adjacent the anode catalyst (14), and a cathode flow path (38) in fluid communication with the cathode catalyst (16) for directing the oxidant stream to flow through the fuel cell (12) and adjacent the cathode catalyst (14);

b. a hydrogen inlet valve (52) secured between a hydrogen containing reducing fluid fuel source (54) and the

anode flow path (24) for selectively permitting the hydrogen fuel to flow into the anode flow path (24);

c. an oxidant inlet valve (56) secured between an oxygen containing oxidant source (58) and the cathode flow path (38) for selectively permitting the oxidant to flow into the cathode flow path (38);

d. hydrogen transfer means secured in communication between the anode flow path (24) and the oxidant flow path (38) for selectively permitting flow of the hydrogen fuel between the anode flow path (24) and the cathode flow path (38);

e. hydrogen reservoir means secured in fluid communication with the anode flow path (24) for storing the hydrogen fuel whenever the hydrogen inlet valve (52) is open to permit flow of the hydrogen fuel through the anode flow path (24), and for releasing hydrogen fuel into the anode flow path (24) whenever the hydrogen inlet valve (52) is closed; and,

f. ~~The system of claim 1, further comprising~~ a cathode bypass valve (72) secured in fluid communication with a cathode exhaust (44) of the cathode flow path (38), a cathode bypass line (74) secured in fluid communication between the cathode bypass valve (72) and a cathode inlet (40) of the cathode flow path (24), and one of a cathode bypass blower (76) secured to the cathode bypass line (74) or an oxidant blower (60) secured to the cathode inlet (40) for selectively directing and accelerating flow of a cathode exhaust

stream from the cathode exhaust (44) through the cathode inlet (40) of the cathode flow path (24).

Claim 11 (currently amended) A hydrogen passivation shut down system for a fuel cell power plant (10), the system comprising:

a. at least one fuel cell (12) for generating electrical current from hydrogen containing reducing fluid fuel and oxygen containing oxidant reactant streams, the fuel cell (12) including an anode catalyst (14) and a cathode catalyst (16) on opposed sides of an electrolyte (18), an anode flow path (24) in fluid communication with the anode catalyst (14) for directing the hydrogen fuel to flow through the fuel cell (12) and adjacent the anode catalyst (14), and a cathode flow path (38) in fluid communication with the cathode catalyst (16) for directing the oxidant stream to flow through the fuel cell (12) and adjacent the cathode catalyst (14);

b. a hydrogen inlet valve (52) secured between a hydrogen containing reducing fluid fuel source (54) and the anode flow path (24) for selectively permitting the hydrogen fuel to flow into the anode flow path (24);

c. an oxidant inlet valve (56) secured between an oxygen containing oxidant source (58) and the cathode flow path (38) for selectively permitting the oxidant to flow into the cathode flow path (38);

d. hydrogen transfer means secured in communication between the anode flow path (24) and the oxidant flow path (38) for selectively permitting flow of the

hydrogen fuel between the anode flow path (24) and the cathode flow path (38);

e. hydrogen reservoir means secured in fluid communication with the anode flow path (24) for storing the hydrogen fuel whenever the hydrogen inlet valve (52) is open to permit flow of the hydrogen fuel through the anode flow path (24), and for releasing hydrogen fuel into the anode flow path (24) whenever the hydrogen inlet valve (52) is closed; and,

f. ~~The system of claim 1, further comprising~~ an anode exhaust vent (34) secured in fluid communication with the anode flow path (24) for directing an anode exhaust stream away from the fuel cell (12) out of the power plant (10), and a cathode exhaust vent (48) secured in fluid communication with the cathode flow path (38) for directing a cathode exhaust stream away from the fuel cell (12) and out of the power plant (10), wherein the anode exhaust vent (34) and cathode exhaust vent (48) are secured below the fuel cell (12) with respect to a directional force of gravity (53).

Claim 12 (Original) The system of claim 11, wherein the anode exhaust vent (34) is a vacuum release valve and the cathode exhaust vent (48) is a vacuum release valve to prevent a vacuum from forming inside the fuel cell (12).

Claim 13 (Canceled)

Claim 14 (Canceled)

15. (Currently amended) A hydrogen passivation shut down system for a fuel cell power plant (10), the system comprising:

a. at least one fuel cell (12) for generating electrical current from hydrogen containing reducing fluid fuel and oxygen containing oxidant reactant streams, the fuel cell (12) including an anode catalyst (14) and a cathode catalyst (16) on opposed sides of an electrolyte (18), an anode flow path (24) in fluid communication with the anode catalyst (14) for directing the hydrogen fuel to flow through the fuel cell (12) and adjacent the anode catalyst (14), and a cathode flow path (38) in fluid communication with the cathode catalyst (16) for directing the oxidant stream to flow through the fuel cell (12) and adjacent the cathode catalyst (14);

b. a hydrogen inlet valve (52) secured between a hydrogen containing reducing fluid fuel source (54) and the anode flow path (24) for selectively permitting the hydrogen fuel to flow into the anode flow path (24);

c. an oxidant inlet valve (56) secured between an oxygen containing oxidant source (58) and the cathode flow path (38) for selectively permitting the oxidant to flow into the cathode flow path (38);

d. hydrogen transfer means secured in communication between the anode flow path (24) and the oxidant flow path (38) for selectively permitting flow of the hydrogen fuel between the anode flow path (24) and the cathode flow path (38);

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e. hydrogen reservoir means secured in fluid communication with the anode flow path (24) for storing the hydrogen fuel whenever the hydrogen inlet valve (52) is open to permit flow of the hydrogen fuel through the anode flow path (24), and for releasing hydrogen fuel into the anode flow path (24) whenever the hydrogen inlet valve (52) is closed; and,

f. a hydrogen sensor means secured in communication with the fuel cell (12) for detecting a concentration of hydrogen within the anode flow path (24) and the cathode flow path (38), ~~The system of claim 14,~~ wherein the hydrogen sensor means comprises a sensor circuit (80) secured in electrical communication with an external circuit (82), which external circuit (82) is secured in electrical communication with the anode catalyst (14) and the cathode catalyst (16) the sensor circuit (80) including a power source (84), a voltage-measuring device (86), and a sensor circuit switch (88), the sensor circuit (80) being secured to the fuel cell (12) so that the power source (84) may selectively deliver a pre-determined sensing current to the fuel cell (12) for a pre-determined sensing duration for measuring a voltage difference between the anode catalyst (14) and cathode catalyst (16).

Claims 16 - 27 (canceled)